Quantifying The Effects Of Streamflow Regulation On Aquatic Habitat In The Upper Osage River Basin, West-Central Missouri

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Background

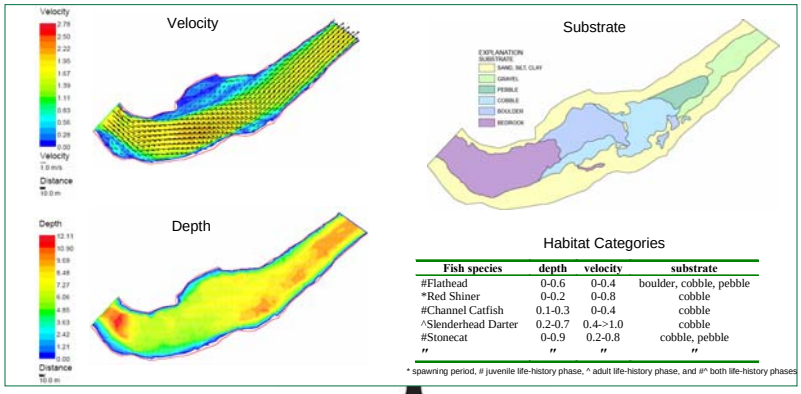
Currently (2005) 35, 2, and 15 percent of the Marais des Cygnes, Little Osage, and Marmaton River basins, comprising the Upper Osage Basin, are regulated by impoundments above the Missouri-Kansas State Line. Plans to construct an additional 300 flood-control impoundments will eventually increase basin control to 45, 2, and 59 percent of the Marais des Cygnes, Little Osage, and Marmaton Basins, respectively . Demand on streamflows for irrigation, wetland management, drinking-water supplies, and power plants also has increased in recent years. The combined effects of the impoundments and increases in water use will be to modify the quantity and timing of streamflow, which could have adverse ecological effects on downstream aquatic and riparian communities.

Quantify Aquatic Habitat With Change In Discharge

Objective:

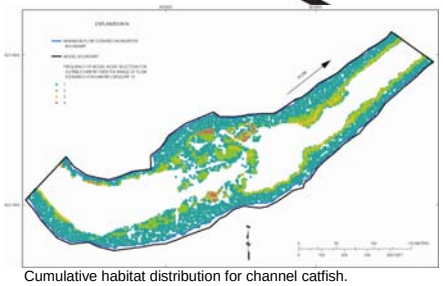
Use **River2D**, a two-dimensional hydraulic model, to determine the relation between discharge and habitat area for select fish species.

Upper Osage River basin with study sites identified.

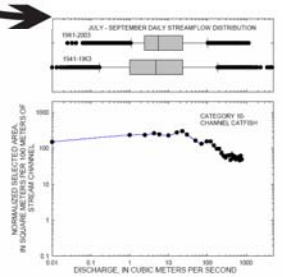


Fish species	depth	velocity	substrate
#Flathead	0-0.6	0-0.4	boulder, cobble, pebble
*Red Shiner	0-0.2	0-0.8	cobble
#Channel Catfish	0.1-0.3	0-0.4	cobble
^Slenderhead Darter	0.2-0.7	0.4->1.0	cobble
#Stonecat	0-0.9	0.2-0.8	cobble, pebble
"	"	"	"

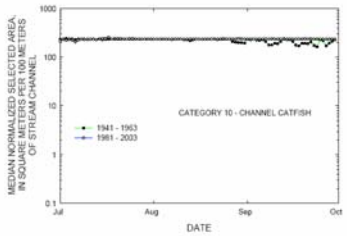
* spawning period, # juvenile life-history phase, ^ adult life-history phase, and #^ both life-history phases



Cumulative habitat distribution for channel catfish.



Relation between normalized selected habitat-area and discharge.

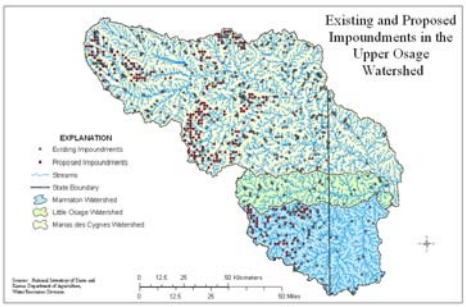


Normalized selected habitat-area time series for channel catfish during summer (July-October).

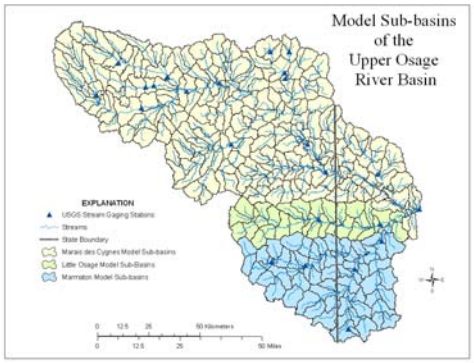
Quantify Hydrologic Change With Change In Regulation

Objective:

Determine the effects of regulation and point-source withdrawals using **BASINS/HSPF** for pre-impoundment, current, and proposed-impoundment scenarios.



The spatial distribution of existing and proposed impoundments in the Upper Osage watershed.



The model sub-basins were generated by BASINS. These sub-basins were based upon USGS gaging station locations, meterological stations, and existing and proposed impoundments. The sub-basins will be fed into the HSPF model and the hydrology of the basin will be calibrated and validated for water years 1995-2004. The calibrated and validated parameters will then be used to simulate the pre-impoundment and proposed-impoundment scenarios.

Quantify Effects Of Streamflow Regulation On Aquatic Habitat

Objective:

Compare aquatic habitat availability under pre-impoundment, current, and proposed-impoundment flow conditions.

The streamflow results from the watershed modeling project will be combined with the quantified habitat categories from the 2D model. New normalized selected habitat-area time series will be generated for selected fish species. These new time series will be used to quantify how pre-impoundment and proposed-impoundment habitats differ from current conditions.